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THE NEW EPOCH AND THE CURRENCY.

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NOT every one realizes how different are the conditions in which we live from those under which the Republic was born. The difference in the conditions is largely due to the work of the engineer during the century which is now drawing to a close. Perhaps an engineer can explain their meaning in a way which may help to dispel some of the clouds in which the horizon is now enveloped.

A little more than a century ago an event occurred which marked the beginning of a change in the world's history exceeding anything which had preceded it; up to that time, however great the intellectual, artistic, or military achievements which man had accomplished, his capacity had always been limited to his own strength and that of the animals he could control. The change came when he learned to *manufacture power*. It is to this capacity that all the great advances of the nineteenth century must be ascribed; I use the words advisedly. Creation, whether of substance or force, is not given to man; manufacture is not creation, but to change inert matter from one form to another in such a way as to generate power is to manufacture power, and this we can do.

The manufacture of power means practically unlimited power; whatever the measure of a single tool, that tool can be used to make a greater one. We are no longer limited by animal units, by locations of water-powers, nor by the force of wind and tide; power can be had where it is needed and when it is needed. The power generated in a modern steamship in a single voyage across the Atlantic is more than enough to raise from the Nile and set in place every stone of the great Egyptian pyramid.

The manufacture of power has barely begun. The steam engine is almost the sole representative ; the great advances in electricity have been in conveying power already manufactured, though transmutation and conveyance of power are closely allied to its manufacture. New forms of manufactured power may come at any time, but the great change came with the capacity to manufacture power at all ; the method is a secondary thing. The manufacture of power has made the physical development of the nineteenth century exceed that of the whole previous life of the world. When future generations record the history of our times they may select the date when man began to manufacture power as the division between the ancient and the modern, between the ages of ignorance and of intelligence, between the early barbarous periods and the new civilization which has not yet received a name.

Hitherto different races have existed simultaneously in every period of development, but the new epoch must from its very nature become universal. The manufacture of power has given the means of traversing the entire globe with a speed which brings all races together. It will gradually substitute the natural boundaries of convenient government for accidental tribal divisions. It will finally make the human race a single whole working for ends which we cannot yet foresee.

It is easy to understand that, when the manufacture of power is fully developed, all physical work may be dependent on inanimate force. It is easy to see that this means the concentration of enormous masses of power where power never could be had before ; that it means the subdivision of power into units of minuteness hard to conceive ; that it means the unravelling of mysteries which have never been solved ; that it means the construction of works of a magnitude before which the greatest monuments of antiquity become insignificant. The fighting ship of to-day is a floating machine shop, though its crew of mechanics are confined as completely as the chained rowers of a Roman galley. The battles of the future will not be fought by men or by horses ; the camels of the desert will never again confront the elephants of the jungle ; fortifications will be factories filled with power. It is easy to recognize that the discoveries already made may be slight in comparison with those which are to come. All this is a matter of physical possibility ; it is interesting to speculate

upon it ; it is foolish to prophesy about it ; the changes already made are enough to consider now ; these changes and their effects are before us to-day.

First, then, the manufacture of power has entirely changed all methods of communication ; the railroad has replaced the stage coach ; the steamship has supplanted the graceful sailing vessel, and the telegraph has supplemented the laggardly mail ; all this has been the work of the engineer.

In the early part of the century, to travel at the rate of 100 miles a day was so difficult a thing that few people were willing to undertake it ; now 800 miles can be accomplished with little fatigue in 24 hours and even this speed has been materially exceeded. The first President of the Republic spent weeks going from his home in Virginia to take the oath of office in New York ; to-day there is no part of our country, except Alaska, from which a citizen cannot reach the national capital in less than six days. If we consider simply the time taken to travel personally, neglecting the other methods of communications, in which much greater speed has been attained, every part of the country has now become nearer the most distant section than Boston was to Richmond one hundred years ago ; this is what the railroad has done.

Only sixty years ago the entire business on the ocean was done by sailing vessels ; they had improved in size, speed, and model since Columbus crossed in his caravels, but the only power to propel them was still the uncertain action of the wind. A good eastward voyage across the Atlantic consumed twenty days, while the return voyage usually took at least twice that time. This was the quickest method of communication between America and all the rest of the world ; it was only under very exceptional conditions that any one could leave an American port and reach some of the nearer ports in Europe and return in as short a time as two months, and this was true not only of men and women, but of mails and every kind of communication. To-day it is possible to cross the Atlantic and return in less than two weeks ; the usual time occupied by passenger steamers in a round voyage, including the time which they wait in port on both sides the Atlantic, and including voyages to as distant ports as Bremen and Hamburg, is now four weeks, while the steamers of one of the leading steamship lines are making a round voyage every three weeks. The entire circuit of the globe

can be accomplished in less time than was commonly necessary for a hurried trip to a near European port and return in the early years of the century.

The mails follow the same course as passengers; they are taken on the fastest ships and the fastest railroad trains, but they have the advantage that they are transferred from train to train and from train to ship at the quickest speed, and are free from the delays of inspection and sometimes of quarantine which annoy passengers. The cost of sending a letter to the most distant part of the globe is only one-fifth as much as the cost of sending it from one State to another in the early days of the Republic.

Great as these changes are, from a business point of view the effect of the telegraph is still greater; it has been able to annihilate time in communication between different towns, states and countries; there is no important business centre in any part of the globe to which a message cannot be sent and a reply received within 24 hours, the delays generally being due not to the time occupied in transmission or delivery, but to the fact that the rotation of the earth and the different times of light and darkness make the business day in our continent simultaneous with the silent dark hours of sleep in populous Asia.

The result of this quick communication has been an absolute change in all methods of doing business. Formerly each community was a unit by itself; it handled its own business; its people seldom went outside of its own limit, and such luxuries as were obtained from a distance were brought at long intervals either by their owners or by people specially charged with handling them. The food, dress, and all the habits of each community were dependent on its immediate surroundings. If the soil and climate were adapted to wheat, the white bread of the present day was a common food, but in other regions where corn and rye grew better, wheat bread was seldom seen. Homespun garments were the usual wear; the luxuries of imported fruits were unknown. The merchant in a seaport sent his ship to sea in charge of a supercargo whom he recognized as a capable business man, loaded with a cargo which that officer was to sell, and with the proceeds of which he was to make purchases for the return voyage. The chances were that from the time the ship left till it returned nothing would be heard of it. The capital

invested in the cargo was absolutely locked up, and the merchant knew little or nothing of the success of his venture until the ship, returning from a voyage of perhaps a year, was sighted off the harbor ; it was in those days that people talked of what they would do when their ship came in. To-day any such voyage is absolutely impossible. A commerce, of a tonnage before which that of the old supercargo days becomes insignificant, is done by regular lines of steamers sailing to almost every part of the world on regular schedules, from which they seldom vary more than one or two days, and whose arrival at every port is known at every other port at which they touch, within 24 hours of the time they reach there. The sailing fleet of to-day no longer goes out with ventures under the charge of supercargoes, but the ship takes a load of goods for which freight is paid, and which is consigned to some merchant in the port to which it sails, where the ship again loads for another port ; the captain sails the ship, which is simply a means of transportation ; the business is handled by merchants in the several ports, and every one of these merchants has the means of knowing what goods are in demand, and what prices they will bring in every other port in the world. Commercially the whole earth has already become a single unit, in every part of which business can be directed from every other part.

This is what the manufacture of power has accomplished by its improvement in methods of transportation and communication alone. No nation can live by itself; it is a part of the whole commercial world; it can be politically independent of other countries, but it cannot be independent of the general laws which govern trade and commerce. Even if it desired to do so, it would not be allowed to keep clear of the developments of the nineteenth century. The very system of commercial credits which played so important a part in all international commerce thirty years ago is now passing away; regular steamship lines and telegraph cables have changed the practice; the commercial standing of every firm can be known everywhere and the aid of the few great houses is no longer needed; a course which would impair the standing of any important business house in an inland American city may be felt in Eastern Asia.

The manufacture of power has effected at least an equal change in all varieties of manufactures. Homespun garments

have disappeared, complicated machinery directed by few hands produces nearly every manufactured product which is essential to man. The spinning wheels, which were a necessary part of our great grandmothers' households, are now kept only as curiosities in bric-a-brac decorations, while the housewife who could weave even her own supply of linen would be very hard to find.

It is not necessary to go into the details of this change ; the result has been accomplished by substituting for the muscle of arm and leg, the power which the steam engine or the turbine wheel provides, power which is fed on coal at five cents a bushel instead of power fed on wheat at eighty cents, or which is furnished free in the slopes of rivers.

This is not merely the case with cloths and fabrics ; it is true of every kind of manufacture and every kind of work ; power has so reduced the price of all the little articles which enter into our daily life that no one can afford to make them himself. In the older parts of the country there are old barns the frames of which were so made that the boards could be fastened in without nails ; when they were built the price of nails was more than ten times what it is now, while the value of a workman's time was only about one-third its present value.

The development of iron manufacture shows what has been done. Only twenty years ago nothing typified the strain of human labor more than the row of furnaces in which the puddlers, by muscular effort and in glaring heat, slowly drew together the particles of soft metal into the spongy puddle-ball from which wrought iron was forged and rolled. To-day the Bessemer converter and the open-hearth furnace have spoken the doom of wrought iron, which is disappearing before the less costly steel ; and there is nothing more striking about a great steel-plant than the absence of men ; ingots, blooms, billets, and finished product seem to make themselves, while the few men who stand around appear to police the machinery rather than to labor.

It was common in country districts in the early part of the century to find families who bought almost nothing ; their food was all raised on their farms, while the clothing and all the household linen was of wool or flax raised at home, spun and woven by the mothers and daughters of the family. To-day it is still possible to find places where people live well and where all the food is raised at home, but in the whole United States it is doubtful

whether 100 families can be found who do not buy their clothing and nearly all their household goods.

The results may be very briefly stated; cheap manufactured power does the work, a few intelligent hands direct the machinery and a day's labor expended in other ways will buy ten times as much cloth or any other manufactured articles as the good hands of our capable grandparents could make in a day.

Perhaps the manufacture of power has had less influence in agriculture than in anything else, but even here the effect has been enormous. In the first place it has filled the world with a great variety of agricultural machinery, which has reduced the labors of the farmer to a small fraction of what they formerly were, till the same man can accomplish with these tools four or five times as much as he could do without them. But there is another remarkable change; the crops of every part of the world have become available for the rest of the world; a failure of crops in one country is known immediately 10,000 miles away; a surfeit of crops in one country is known with equal promptness; prices are regulated not by immediate home demand, but by the supplies and demands of the world modified by cost of transportation and a few other complications which are well understood by dealers everywhere. The farmer of the present day feels all this; he has ceased to be able to live from his farm alone; to maintain his family with the luxuries and habits which people now think necessary he must draw upon all parts of the world, and it is only by selling his crops that he can pay for what he so purchases. In the older farming districts this may apply to little more than clothing and a few unnecessary luxuries, but in the newer districts it is otherwise; on the prairies west of the Missouri the farmer raises little but grain and stock; everything else, even the fuel to keep him warm in winter blizzards, must be bought.

The general effects already accomplished by the manufacture of power may be briefly stated. Every part of the civilized world now draws its supplies from every other part of the world; even the savage or barbarous regions, which get nothing from outside their own country, are forced to render their contributions to civilized lands. Prices are fixed by the whole world, not by any one community, the cost of transportation and tariff charges being simply additions to the cost of the article some-

where else. Furthermore, every civilized family must buy a large portion of what it consumes, and practically all but farmers must buy everything they consume. If the price of wheat rises in Liverpool it rises on every farm in the United States; if a great surplus is produced in India or Argentina the price falls in European markets and on every farm in the United States.

It is the glory of the engineering profession that it has reduced the cost of almost every article of important use in modern life; it is the crowning merit of the nineteenth century that it has made cheap so many things which in our fathers' times were dear. The older inhabitants can remember the pinched, underfed look of a large portion of our people in the early days of the century when their wages would not provide them with either adequate food or suitable clothing; such people may still be seen, but there are few of them among the plump, well-clad people of to-day. It is a rarer thing to see children barefoot now than it was to see them with shoes fifty years ago. Let no one find fault with the lowering of prices of those articles which are necessary for the common support of all—of food, of fuel, or of ordinary clothing. It has been the business of the engineering profession to accomplish this result.

The work of the engineer has cheapened all the necessities of life; it has done so by substituting inanimate force for human muscle and strength, and it has done so by rendering the products of every part of the world available in every other. Great as this work is, it is not the whole; the change is elevating mankind and putting him in a better position than he was in before.

The substitution of inanimate power for the animal power on which our race was formerly dependent means a separation of the force which does the work from the intellect which directs it. The power which we make and use is absolutely without sense. All this must come from the human mind. The man who drives a horse has little to do; the horse finds the way and does the work, but the driver of a motor carriage has a senseless machine, and all direction must come from him. Manufactured power demands intelligence to supply the sense which the power lacks. The extreme logical development would be a condition where every kind of physical work is performed by machines, while human effort is reduced to design and care. Such a result will never be reached. So long as men have bodies, the forces placed

in those bodies must be used, but the substitution of manufactured power for human labor is a promotion for man, whose value becomes measured by skill in directing power and not by muscular strength. A man's wages are determined, not by what he can do himself, but by what he can have done. The character of his work has risen ; his average pay is better.

One other thing must be observed : the gain is accruing to civilized nations. Savage and barbarous nations are made to contribute their share towards the comforts of the civilized without receiving much return. This cannot continue. Savage and barbarous people disappear before the stronger arms of the more civilized ; a few people are elevated, more of them are crushed. It is a constant struggle for supremacy in which the nation which has the greatest resources, the greatest strength, and understands best how to manufacture and use power, always comes out ahead. To do this it must know what every other land is doing ; it must use the tools which the engineers of every country have provided ; it must avail itself of the work of all. There was a time when nations could shut themselves up within their own limits and do very well. It amounted to little more than excluding some foreign trade, which at best was small ; the whole world was nearly stationary ; the improvements made in foreign countries amounted to so little that the work done at home was all that was needed. Japan lived in this way for centuries with laws, practices, and currency entirely unlike anything now in the world ; gold and silver were kept in circulation together at a valuation in which gold was only four times as high as silver. The manufacture of power has rendered anything like this absolutely impossible. There is no race or people so great that it could afford to shut itself out for ten years from what is going on elsewhere. To use a slang expression, *it would be left* ; the simple result would be that after a decade of stagnation it would find itself remanded to a secondary position among the nations of the world and become a servant where it should have been a master.

The lessons of history must be studied as showing the mistakes of the past, not as giving precedents to be followed now. We have already entered on an entirely new epoch in civilization, the epoch created by the manufacture of power ; the works and doings of the past are not those of the present. History gives us a record of what has been done, but no more. It would be as

wise to cite the habits of savage life as the ways which civilized nations should follow, as to make the practice of the beginning of this century, before the effect of the manufacture of power had been felt, the standard of the present day.

In the race which we are now in the midst of, which the manufacture of power is opening, new influences, new appliances, new powers and new forms of education appear every day; only by constant effort, constant intercourse, continual study and vigorous achievements can any country use the talents which are now before it. The cry of "America for Americans" may be all right, but if the Americans are to make the best use of their America they must call to their aid the work which the brains of Europe, and before long those of Asia, will contribute to the general benefit of mankind.

There are other laws than those which are enacted by legislative bodies, whether those laws be expressed in constitutional enactments, in judicial decisions, or in that organic law which has come to be called constitutional. In history the laws of religion have perhaps played a greater part than the civil laws of states; many of these religious laws have been the work of designing priests or wild impostors, but the preaching of Peter the Hermit carried the young men of Europe to Syria, and the trumpet of the Prophet spread Islamism over the early home of Christianity. There are the laws of logic and mathematics, which are absolute and fixed; it is beyond any power, either human or supernatural, to set them aside. Not even the Deity can change the sum of two numbers.

The laws of trade are at least as important as legislative enactments; they involve the arguments of logic, the truths of mathematics, and a knowledge of the various natural conditions which have made the trade of the world possible. From their very nature these laws must be international, except in some country which would set itself up alone and sell its nineteenth century birthright. We get our coffee from South America; we must pay for it the same price that is paid in Europe and it must be paid in a coin which will pass current where the European coin does. We get our tea from Asia; we must get it on the same terms that European nations do. We raise a little of our sugar; the rest we must import from the West Indies and pay the same price for it that Europe would pay.

International trade calls for international money, but there is no such thing as an international coin. A coin whose value is determined by legislative enactment loses that value as soon as it passes the national boundary. The only thing recognized in international transactions is the bullion value of the coins. You cannot take a bag of American eagles to London and have them counted out and valued by number; they are put in the scales and their value is the actual weight of gold. You cannot bring a bag of English sovereigns to New York and have them accepted in any way but by weight; each is equivalent to so much gold bullion, nothing more. The same may be said of silver in international transactions; the trade of Asia is conducted in silver, but this silver is handled at its bullion value, not as coins. The Chinese merchant keeps his account in taels. There is no such coin as a tael; it is only a weight of silver. To discharge an obligation he weighs out enough silver, perhaps Mexican dollars, to make the necessary number of taels, and chops up the last dollar to get the exact weight. As soon as any kind of currency leaves the protection of the laws that made it, it loses all value excepting its bullion worth; this is an inherent value which nothing can take from it. Prices may vary, but an ounce of gold is always 480 grains. Any value beyond this is a value made by a local government dependent on local conditions, subject to repeal or change by the law of the land; it is a fiat element and no more. There is no such thing as an international legal tender; it is an impossibility. If all the nations of the world were to unite in making one, it would only be good so long as no treaty obligation was violated.

We were first introduced to legal tenders in the dark days of the war, when the government needed money to sustain its very existence and issued notes which were promises to pay, making them legal tenders in private transactions. Outside of the country they never had a value exceeding the foreign estimate of the promise to pay; even California, a loyal state of the Union, refused to accept them and insisted on recognizing no other money than gold. The present silver dollar owes its present value entirely to the fact that it is exchangeable for gold.

Gresham's law is perfectly simple. With a currency consisting partially of gold and partially of silver, neither exchangeable for the other except at the pleasure of the government which

coins them, but both legal tenders within the United States, we should have two classes of money, both of which could be used in domestic transactions, and only one of which could be used in international transactions. The one which could be used for the two purposes would be more valuable than the one that could be used for one ; it would be taken for international transactions and would go abroad ; bankers and merchants would buy and keep it for this purpose. The other one, equally legal for domestic transactions, would be the only domestic currency left. No one would take the more valuable money to pay bills for which the other money was equally good. The result would be what it has always been before : the world would value our cheaper legal tender at its bullion value and nothing more ; the other money would have its bullion value in the world at large, and the premium which it commanded at home would be measured by the differences in the two bullion values. When the international money had been absorbed, nothing would be left but the domestic silver. One would be abroad, the other at home ; one would be used in foreign transactions, the other in domestic ; no law of this country could control both ; their relations must be determined solely by the bullion values of the two metals, as they would exist on their merits alone.

Trade would, of course, continue to go on, but compared with other nations on the basis of a depreciated currency. The only way in which depreciation could be prevented would be by closing all communications with foreign nations ; by giving up our coffee, our tea, with all other necessities and luxuries which we can only get from abroad ; by stopping our communications with other countries ; and in these days, when an old Asiatic power, which for centuries shut itself aloof from the world, is trying to become one of the foremost modern nations, we should voluntarily take the isolated position from which our own navy forced Japan forty years ago. This could only be accomplished by sacrificing all that the last hundred years have given us which the engineering profession has made possible through the manufacture of power.

GEORGE S. MORISON.